Missouri Department of Natural Resources

MO Risk-Based Corrective Action for Petroleum Storage Tank Sites Sampling for Polynuclear Aromatic Hydrocarbons

Hazardous Waste Program technical bulletin 4/2005

What are Polynuclear Aromatic Hydrocarbons?

Polynuclear aromatic hydrocarbons (PAHs) are hydrocarbon compounds with multiple benzene rings. PAHs are typical components of asphalts, fuels, oils and greases. They are also called Polycyclic Aromatic Hydrocarbons. PAHs are associated with heavy petroleum, including diesel fuel, jet fuel, kerosene, heavy fuel oils and waste oil. The analytical standards used under the Missouri Risk-Based Corrective Action (MRBCA) process report these types of petroleum as either Diesel Range Organics (DRO) or Oil Range Organics (ORO).

What are the MRBCA provisions for sampling PAHs in surficial soil?

Surficial soil is soil from the surface of the ground to a depth of three feet. Risks associated with PAHs are the greatest through ingestion and dermal contact exposure routes. All surficial soil samples that contain total petroleum hydrocarbons (TPH) with DRO or ORO at a concentration above laboratory detection limits or the required reporting limits (RRLs) shown in Table 5-3 of the MRBCA guidance, whichever are lower, must be analyzed for the PAHs listed in Table 5-1 of the MRBCA guidance.

What are the MRBCA provisions for sampling PAHs in subsurface soil?

Subsurface soil is soil in the zone between a depth of three feet and the top of groundwater. Due to its low vapor pressure, PAHs do not readily migrate in a vapor form. Therefore, the vapors to indoor air pathway is of negligible concern in evaluating the risks posed by PAHs. Except for naphthalene, the Department of Natural Resources does not require that every subsurface soil sample containing detectable TPH-DRO or TPH-ORO be analyzed for the PAHs listed in Table 5-1 of the MRBCA guidance. Rather, samples should be analyzed for PAHs as follows:

- Only samples containing TPH-DRO or TPH-ORO at concentrations above laboratory detection limits or the RRLs, whichever are lower, need be analyzed for PAHs.
- A minimum of 25 percent, or two samples, whichever is greater, of the total number of subsurface soil samples found containing TPH-DRO or TPH-ORO must be analyzed for the PAHs listed in Table 5-1 of the MRBCA guidance.
- The samples to be analyzed for PAHs shall be the 25 percent or two samples, whichever is greater, that contain the highest concentrations of TPH-DRO or TPH-ORO. However, only one sample from each boring shall be analyzed for PAHs. If the samples with the highest

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concentrations of TPH-DRO or TPH-ORO came from the same boring, the sample with the highest TPH-DRO or TPH-ORO should be analyzed for PAHs. The rest of the samples should come from other borings in which TPH-DRO or TPH-ORO was detected.
- In certain cases where pathways associated with the construction worker are of concern, the department may require additional subsurface soil samples be analyzed for PAHs.
- These provisions do not pertain to naphthalene due to its unique physical and chemical properties. All subsurface soil samples shall be analyzed for naphthalene.

What are the MRBCA provisions for sampling PAHs in groundwater?

PAHs generally do not readily partition into groundwater in significant concentrations because PAHs tend to have very low water solubilities and a tendency to absorb to soil. Therefore, with the exception of naphthalene, the department does not require all groundwater samples having detectable TPH-DRO or TPH-ORO be analyzed for the PAHs listed in Table 5-1 of the MRBCA guidance. Rather, groundwater samples shall be analyzed for PAHs in accordance with the following provisions:

- Only those samples having concentrations of TPH-DRO or TPH-ORO above the laboratory detection limits or the RRLs listed in Table 5-3 of the MRBCA guidance, whichever are lower, need be analyzed for PAHs.
- A minimum of 25 percent or two samples, whichever is greater, of the groundwater samples found to contain detectable TPH-DRO or TPH-ORO shall be analyzed for PAHs.
- Samples to be analyzed for PAHs shall be the 25 percent or two samples, whichever is greater, that contain the highest concentrations of TPH-DRO or TPH-ORO.
- In certain cases where the Department of Natural Resources finds or expects the solubility of PAHs to be increased due to the presence of other contaminants in soil or groundwater, the department may require additional water samples be analyzed for PAHs.
- Due to its unique chemical and physical properties, the above provisions do not apply to naphthalene; all water samples shall be analyzed for naphthalene.

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